WHAT IS CLAIMED IS:

1. An actuator, comprising:

a rotor that includes:

a magnet that has a cylindrical shape, and an outer peripheral surface alternately magnetized into different poles in a peripheral direction; and

a soft magnetic member that is fixed to an inner diameter portion of the magnet;

a coil that is concentric with the magnet, and arranged adjacently to the magnet in an axial direction thereof; and

a stator that has a magnetic pole portion opposed to the outer peripheral surface of the magnet,

wherein the soft magnetic member composing the rotor, and the stator are excited by the coil.

2. An actuator according to claim 1, wherein the magnetic pole portion of the stator is formed into a shape extending in a direction of rotation axis of the magnet along a shape of an opposed surface of the magnet.

3. An actuator according to claim 1, wherein said soft magnetic member is arranged on an inner diameter side of the magnet.

4. An actuator according to claim 1, wherein

the soft magnetic member composing the rotor is an output shaft.

5. An actuator, comprising:

a rotor that includes:

a magnet that has a cylindrical shape, and an inner peripheral surface alternately magnetized into different poles in a peripheral direction; and

a soft magnetic member that is fixed to an outer diameter portion of the magnet;

a coil that is concentric with the magnet, and arranged adjacently to the magnet in an axial direction thereof; and

a stator that has a magnetic pole portion opposed to the inner peripheral surface of the magnet,

wherein the soft magnetic member composing the rotor, and the stator are excited by the coil.

6. An actuator according to claim 5, wherein the magnetic pole portion of the stator is formed into a shape extending in a direction of rotation axis of the magnet along a shape of an opposed surface of the magnet.

7. An actuator according to claim 5, wherein the soft magnetic member composing the rotor is an output shaft.

8. An actuator, comprising:

a magnet ring that is equally divided in a peripheral direction, and includes a permanent magnet having a cylindrical shape and having different poles magnetized alternately;

a first coil and a second coil each having a cylindrical shape, which are concentric with the magnet ring, and arranged in opposite positions across the magnet ring along an axial direction thereof;

a first outside magnetic pole portion that is opposed to a partial outer peripheral surface of the magnet ring on a side of the first coil so as to have a predetermined clearance, and is excited by the first coil;

a second outside magnetic pole portion that is opposed to another partial outer peripheral surface of the magnet ring on a side of the second coil so as to have a predetermined clearance, and is excited by the second coil;

a first shaft that is formed of a soft magnetic material, inserted into an inner diameter portion of the first coil, and fixed to an inner diameter portion of the magnet ring; and

a second shaft that is formed of a soft magnetic material, inserted into an inner diameter portion of the second coil, and fixed to an inner

diameter portion of the magnet ring.

9. An actuator according to claim 8, wherein the first shaft is an output shaft.

10. An actuator according to claim 8, wherein:

the first shaft is rotatably supported by the first bearing fixed to the first outside magnetic pole portion; and

the second shaft is rotatably supported by the second bearing fixed to the second outside magnetic pole portion.

11. An actuator according to claim 8, wherein the first bobbin and the second bobbin also serve as the first bearing and the second bearing, respectively.

12. An actuator according to claim 8, wherein:

the first shaft is fixed to the first outside magnetic pole portion, and rotatably supported by the first bearing formed of a soft magnetic material;

the second shaft is fixed to the second outside magnetic pole portion, and rotatably supported by the second bearing formed of a soft magnetic material; and

at least one of the first shaft, the first

bearing, the second shaft, and the second bearing has its sliding surface subjected to one of lubricant coating and lubricant plating, and has its sliding portion subjected to lubricant application.

13. An actuator, comprising:

a magnet ring that is equally divided in a peripheral direction, and includes a permanent magnet having a cylindrical shape and having different poles magnetized alternately;

a first coil and a second coil that are concentric with the magnet ring, and arranged in opposite positions across the magnet ring along an axial direction thereof;

a first outside magnetic pole portion that is opposed to a partial outer peripheral surface of the magnet ring closer to one end surface thereof, and is excited by the first coil;

a second outside magnetic pole portion that is opposed to another partial outer peripheral surface of the magnet ring closer to another end surface thereof, and is excited by the second coil; and

a rotation shaft that:

is formed of a soft magnetic material;

is fixed to an inner diameter portion of the magnet ring; and

includes at least an inside magnetic pole

portion that is respectively opposed to one of the first outside magnetic pole portion and the second outside magnetic pole portion in an axial range thereof, and are respectively excited by one of the first coil and the second coil.

14. An actuator according to claim 13, wherein said actuator is a stepping motor.

15. An actuator, comprising:

a magnet ring that is equally divided in a peripheral direction, and includes a permanent magnet having a cylindrical shape and having different poles magnetized alternately;

a first coil and a second coil that are concentric with the magnet ring, and arranged in opposite positions across the magnet ring along an axial direction thereof;

a first outside magnetic pole portion that is opposed to a partial outer peripheral surface of the magnet ring closer to one end surface thereof, and is excited by the first coil;

a second outside magnetic pole portion that is opposed to another partial outer peripheral surface of the magnet ring closer to another end surface thereof, and is excited by the second coil; and

a rotation shaft that:

is formed of a soft magnetic material;

is fixed to an inner diameter portion of the magnet ring;

includes a first inside magnetic pole portion and a second inside magnetic pole portion that are respectively opposed to the first outside magnetic pole portion and the second outside magnetic pole portion in axial ranges thereof, and are respectively excited by the first coil and the second coil; and

is formed with a groove between the axial range of the first inside magnetic pole portion opposed to the first outside magnetic pole portion and the axial range of the second inside magnetic pole portion opposed to the second outside magnetic pole portion.

16. An actuator according to claim 15, wherein said actuator is a stepping motor.